

(For Laboratory Use Only)
ATS Labs Project # A15892
11/18/13

ATS LABS

PROTOCOL

AOAC Available Chlorine in Disinfectants

Test Organisms:

Staphylococcus aureus (ATCC 6538)
Salmonella enterica serovar Typhi (ATCC 6539)

PROTOCOL NUMBER

WES20091313.AVC

PREPARED FOR

DeLaval Cleaning Solutions
11100 North Congress Avenue
Kansas City, MO 64153-1296

PERFORMING LABORATORY

ATS Labs
1285 Corporate Center Drive, Suite 110
Eagan, MN 55121

PREPARED BY

Joshua Luedtke, M.S.
Microbiologist

DATE

September 13, 2013

PROPRIETARY INFORMATION

THIS DOCUMENT IS THE PROPERTY OF AND CONTAINS PROPRIETARY INFORMATION OF ATS LABS. NEITHER THIS DOCUMENT, NOR INFORMATION CONTAINED HEREIN IS TO BE REPRODUCED OR DISCLOSED TO OTHERS, IN WHOLE OR IN PART, NOR USED FOR ANY PURPOSE OTHER THAN THE PERFORMANCE OF THIS WORK ON BEHALF OF THE SPONSOR, WITHOUT PRIOR WRITTEN PERMISSION OF ATS LABS.

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 2 of 8

ATS LABS

AOAC Available Chlorine in Disinfectants

SPONSOR: DeLaval Cleaning Solutions
11100 North Congress Avenue
Kansas City, MO 64153-1296

TEST FACILITY: ATS Labs
1285 Corporate Center Drive, Suite 110
Eagan, MN 55121

PURPOSE

The purpose of this study is to determine the available chlorine germicidal equivalent concentrations with products offered for use as sanitizing rinses for previously cleaned nonporous surfaces following the AOAC Chlorine (Available) in Disinfectants Method. This method is in compliance with the U.S. Environmental Protection Agency (EPA).

TEST SUBSTANCE CHARACTERIZATION

Test substance characterization as to content, stability, etc., (40 CFR, Part 160, Subpart F [160.105]) is the responsibility of the Sponsor. The test substance shall be characterized by the Sponsor prior to the experimental start date of this study. Pertinent information, which may affect the outcome of this study, shall be communicated in writing to the Study Director upon sample submission to ATS Labs.

SCHEDULING AND DISCLAIMER OF WARRANTY

Experimental start dates are generally scheduled on a first-come/first-serve basis once ATS Labs receives the Sponsor approved/completed protocol, signed fee schedule and corresponding test substance(s). Based on all required materials being received at this time, the proposed experimental start date is September 24, 2013. Verbal results may be given upon completion of the study with a written report to follow on the proposed completion date of October 21, 2013. To expedite scheduling, please be sure all required paperwork and test substance documentation is complete/accurate upon arrival at ATS Labs.

If a test must be repeated, or a portion of it, due to failure by ATS Labs to adhere to specified procedures, it will be repeated free of charge. If a test must be repeated, or a portion of it, due to failure of internal controls, it will be repeated free of charge. "Methods Development" fees shall be assessed, however, if the test substance and/or test system require modifications due to complexity and difficulty of testing. If the Sponsor requests a repeat test, they will be charged for an additional test. Neither the name of ATS Labs nor any of its employees are to be used in advertising or other promotion without written consent from ATS Labs.

The Sponsor is responsible for any rejection of the final report by the regulatory agencies concerning report format, pagination, etc. To prevent rejection, Sponsor should carefully review the ATS Labs final report and notify ATS Labs of any perceived deficiencies in these areas before submission of the report to the regulatory agency. ATS Labs will make reasonable changes deemed necessary by the Sponsor, without altering the technical data.

JUSTIFICATION FOR SELECTION OF THE TEST SYSTEM

Regulatory agencies require that a specific bacterial claim for a sanitizer be supported by appropriate scientific data demonstrating the efficacy of the sanitizer against the claimed bacteria. This is accomplished by treating the target bacteria with the test substance under conditions which simulate as closely as possible, in the laboratory, the actual conditions under which the sanitizer is designed to be used. For halide-based sanitizer products intended for use on food contact surfaces, a suspension method is used in the generation of the supporting data.

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 3 of 8

ATS LABS

TEST PRINCIPLE

A suspension of bacterial cells is exposed to the test substance and to specific concentrations of control sodium hypochlorite (NaOCl) solutions for a specified exposure time. After exposure, an aliquot of the exposed suspension will be transferred to tubes containing neutralizing subculture media, and the process will be repeated. The subculture tubes will be incubated and assayed for survivors. Appropriate culture purity, sterility, viability, neutralization confirmation and initial suspension controls are performed. The current version of Standard Operating Procedure CGT-4020 reflects the methods which shall be used in this study.

TEST METHOD

Test Organism	ATCC #	Growth Medium	Incubation Parameters
<i>Salmonella enterica</i> serovar Typhi	6539	Nutrient Broth	35-37°C, aerobic
<i>Staphylococcus aureus</i>	6538	Nutrient Broth	35-37°C, aerobic

The test organisms to be used in this study were obtained from the American Type Culture Collection (ATCC), Manassas, VA.

Preparation of Test Organism

From a stock slant, an initial tube (10 mL) of culture broth will be inoculated. This culture is termed the "initial broth suspension." From this initial broth suspension, a minimum of three daily transfers using 1 loopful (10 µL) of culture into 10 mL of culture media will be performed on consecutive days prior to use in testing procedure. For each test organism, the appropriate growth medium will be subcultured using a daily transfer (at least 3, but no more than 15 transfers) of the test organism.

A 48-54 hour broth culture incubated at 35-37°C will be prepared. Vortex mix the culture and allow the culture to stand for ≥10 minutes prior to use. An organic soil load may be added to the test culture per Sponsor's request.

Preparation of Test Substance

The test substance shall be prepared according to the directions for intended use of the product. If the test substance is to be diluted, it shall be used within 3 hours of preparation. Transfer 10 mL of the test substance to sterile tubes. Place the tubes in a waterbath and equilibrate to the exposure temperature for ≥ 10 minutes.

Preparation of the Sodium Hypochlorite (NaOCl) Control Solution

NaOCl control solutions will be prepared to contain approximately 200 ppm, 100 ppm, and 50 ppm sodium hypochlorite. The prepared 200 ppm solution will be titrated and must contain 200 ± 10 ppm sodium hypochlorite. From the 200 ppm solution, the 100 and 50 ppm concentrations will be prepared. Transfer 10 mL of each sample to sterile tubes. Place tubes in a waterbath and equilibrate to the exposure temperature for ≥ 10 minutes.

Exposure Conditions

A 50 µL aliquot of test culture is added to each of the Test Substance and control NaOCl solution and a calibrated timer is started. Mix the inoculated substance and return the tube to the water bath. One minute after inoculation, transfer 10 µL of the inoculated suspension to 10 mL of appropriate neutralizing subculture medium. Thirty seconds later, the test/control material is reinoculated with 50 µL of test culture as before. One minute after the second inoculation, transfer 10 µL of the inoculated suspension to a second tube containing 10 mL of appropriate neutralizing subculture medium. This inoculation/subculture routine is repeated until a total of 10 replicate subcultures for each Test Substance/NaOCl Control concentration have been performed.

Incubation and Observation

All subcultures and controls are incubated for 48±2 hours at 35-37°C (or other appropriate time/temperatures).

Following incubation, the subcultures will be visually examined for growth. If necessary, the subcultures may be placed at 2-8°C for up to three days prior to examination.

Minimally, the first test tube showing growth in each test run will be subcultured, stained and/or biochemically assayed to confirm or rule out the presence of the test organism.

Template: 215-IJ

—Proprietary Information—

1285 Corporate Center Drive, Suite 110 • Eagan, MN 55121 • 877.287.8378 • 651.379.5510 • Fax: 651.379.5549

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 4 of 8

ATS LABS

STUDY CONTROLS

Purity Control

A "streak plate for isolation" will be performed on the test organism culture and following incubation examined in order to confirm the presence of a pure culture. The acceptance criterion for this study control is a pure culture demonstrating colony morphology typical of the test organism.

Organic Soil Load Sterility Control

The serum used for soil load will be cultured, incubated, and visually examined for growth. The acceptance criterion for this study control is lack of growth.

Neutralizing Subculture Medium Sterility Control

A representative sample of uninoculated neutralizing subculture medium will be incubated and visually examined for growth. The acceptance criterion for this study control is lack of growth.

Viability Control

A 50 µL aliquot of each test organism suspension will be transferred to a tube of neutralizing subculture medium. The inoculated neutralizing subculture medium will be incubated and visually examined for growth. The acceptance criterion for this study control is growth.

Neutralization Confirmation Control

When the test subculture tubes in a given set of tubes demonstrate no growth following incubation, at least one tube will be challenged with low levels of the organism. Following incubation, at least one subculture tube (per test run) will be inoculated with a low level of test organism to target ≤ 100 CFU. The actual CFU added back will be enumerated by inoculating duplicate agar plates. The tubes and plates will be incubated as in the test. Following incubation the neutralization confirmation tubes will be examined for growth. The agar plates will be counted to verify the inoculum. This control may be performed with multiple replicates using different dilutions of the test organism. The acceptance criterion for this study control is growth following inoculation with ≤ 100 CFU of test organism.

Initial Suspension Control

The test culture will be serially diluted and plated using standard microbiological techniques. Following incubation, the organism plates will be observed to enumerate the concentration of the test organism present at the time of testing. The acceptance criterion for this study control is a minimum of 1.0×10^6 CFU/mL.

PROCEDURE FOR IDENTIFICATION OF THE TEST SYSTEM

ATS Labs maintains Standard Operating Procedures (SOPs) relative to efficacy testing studies. Efficacy testing is performed in strict adherence to these SOPs which have been constructed to cover all aspects of the work including, but not limited to, receipt, log-in, and tracking of biological reagents including test organism strains for purposes of identification, receipt and use of chemical reagents. These procedures are designed to document each step of efficacy testing studies. Appropriate references to medium, batch number, etc. are documented in the raw data collected during the course of each study.

Additionally, each efficacy test is assigned a unique Project Number when the protocol for the study is initiated by the Study Director. This number is used for identification of the test subculture tubes, etc. during the course of the test. Test subculture tubes are also labeled with reference to the test organism, experimental start date, and test product. Microscopic and/or macroscopic evaluations of positive subcultures are performed in order to confirm the identity of the test organism. These measures are designed to document the identity of the test system.

METHOD FOR CONTROL OF BIAS: N/A

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 5 of 8

ATS LABS

STUDY ACCEPTANCE CRITERIA:

Test Substance Performance Criteria

The activity equivalence of the germicide is determined as compared to the 200 ppm, 100 ppm, 50 ppm available chlorine in the NaOCl standard controls.

Control Acceptance Criteria

The study controls must perform according to the criteria detailed in the study controls description section. If any of the control acceptance criteria are not met, the test may be repeated under the current protocol number.

REPORT

The report will include, but not be limited to, identification of the sample, date received, initiation and completion dates, identification of the organism strains used, description of media and reagents, description of the methods employed, tabulated results and conclusion as it relates to the purpose of the test, and all other items required by 40 CFR Part 160.185.

PROTOCOL CHANGES

If it becomes necessary to make changes in the approved protocol, the revision and reasons for changes will be documented, reported to the Sponsor and will become a part of the permanent file for that study. Similarly, the Sponsor will be notified as soon as possible whenever an event occurs that may have an effect on the validity of the study.

Standard operating procedures used in this study will be the correct effective revision at the time of the work. Any minor changes to SOPs (for this study) or methods used will be documented in the raw data and approved by the Study Director.

TEST SUBSTANCE RETENTION

It is the responsibility of the Sponsor to retain a sample of the test substance. All unused test substance will be discarded following study completion unless otherwise indicated by Sponsor.

RECORD RETENTION

Study Specific Documents

All of the original raw data developed exclusively for this study shall be archived at ATS Labs. These original data include, but are not limited to, the following:

1. All handwritten raw data for control and test substances including, but not limited to notebooks, data forms and calculations.
2. Any protocol amendments/deviation notifications.
3. All measured data used in formulating the final report.
4. Memoranda, specifications, and other study specific correspondence relating to interpretation and evaluation of data, other than those documents contained in the final study report.
5. Original signed protocol.
6. Certified copy of final study report.
7. Study-specific SOP deviations made during the study.

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 6 of 8

ATS LABS

Facility Specific Documents

The following records shall also be archived at ATS Labs. These documents include, but are not limited to, the following:

1. SOPs which pertain to the study conducted.
2. Non study-specific SOP deviations made during the course of this study which may affect the results obtained during this study.
3. Methods which were used or referenced in the study conducted.
4. QA reports for each QA inspection with comments.
5. Facility Records: Temperature Logs (ambient, incubator, etc.), Instrument Logs, Calibration and Maintenance Records.
6. Current curriculum vitae, training records, and job descriptions for all personnel involved in the study.

REFERENCES

1. Association of Official Analytical Chemists (AOAC) Official Method 955.16, Chlorine (Available) in Disinfectants, Germicidal Equivalent Concentration. In Official Methods of Analysis of the AOAC, 2005 Edition.
2. Association of Official Analytical Chemists (AOAC) Official Method 960.09, Germicidal and Detergent Sanitizing Action of Disinfectants Method [Preparation of Synthetic Hard Water]. In Official Methods of Analysis of the AOAC, 2013 Edition.
3. U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, Product Performance Test Guidelines, OCSPP 810.2000: General Considerations for Uses of Antimicrobial Agents, September 4, 2012.
4. U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, Product Performance Test Guidelines, OCSPP 810.2300: Sanitizers for Use on Hard Surfaces- Efficacy Data Recommendations, September 4, 2012.

DATA ANALYSIS

Calculations

$$\text{CFU/mL} = \frac{(\text{Average CFU}) \times (\text{Dilution Factor})}{(\text{Volume plated in mL})}$$

Statistical Analysis

None used.

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 7 of 8

ATS LABS

STUDY INFORMATION

(All sections must be completed prior to submitting protocol)

Test Substance (Name & Batch Numbers, including ≥60 day old batch - exactly as it should appear on final report):

CD6 Solution 3000™. Batch #: 131106-2, 131108-3, 131111-1

Specify ≥60 day old batch (if applicable): NA*

Expiration Date: July 01, 2014

Product Description:

- ☐ Quaternary ammonia
☐ Iodophor
☐ Sodium hypochlorite
☐ Peracetic acid
☐ Peroxide
☒ Other Chlorine Dioxide

Test Substance Active Concentration (upon submission to ATS Labs): 3000 ppm

Neutralization/Subculture Broth:

- ☐
☒ ATS Labs' Discretion. By checking, the Sponsor authorizes ATS Labs, at their discretion, to perform neutralization confirmation assays at the Sponsor's expense prior to testing to determine the most appropriate neutralizer. (See Fee Schedule).

Storage Conditions:

- ☒ Room Temperature
☐ 2-8°C
☐ Other:

Hazards:

- ☐ None known: Use Standard Precautions
☒ Material Safety Data Sheet, Attached for each product
☐ As Follows:

Product Preparation

- ☐ No dilution required, Use as received (RTU)
☒ *Dilution(s) to be tested: 22.5 ppm (LCL at 25 ppm)
0.96 oz/gallon defined as 0.96 oz + 127.04 oz
(example: 1 oz/gallon) (amount of test substance) (amount of diluent)
☐ Deionized Water (Filter or Autoclave Sterilized)
☐ Tap Water (Filter or Autoclave Sterilized)
☒ AOAC Synthetic Hard Water: 300 PPM
☐ Other

*Note: An equivalent dilution may be made unless otherwise requested by the Sponsor.

Test Organisms:

- ☒ *Staphylococcus aureus* (ATCC 6538)
☒ *Salmonella enterica* serovar Typhi (ATCC 6539)

Exposure Temperature: 20±1°C

Organic Soil Load:

- ☐ Minimum 5% Organic Soil Load (Fetal Bovine Serum)
☒ No Organic Soil Load Required
☐ Other:

Test Substance mixing instructions:

- ☐ Test substance is viscous or may create foam during mixing and should be mixed by hand during testing.
☒ Not applicable (test substance may be vortex mixed during testing)

* per email JUL 11-21-13
Ⓢ LCL value to report per email JUL 11-21-13

Template: 215-1J

- Proprietary Information -

1285 Corporate Center Drive, Suite 110 • Eagan, MN 55121 • 877.287.8378 • 651.379.5510 • Fax 651.379.5549

Protocol Number: WES20091313.AVC

DeLaval Cleaning Solutions
Page 8 of 8

ATS LABS

TEST SUBSTANCE SHIPMENT STATUS

- ☐ Has been used in one or more previous studies at ATS Labs .
☐ Has been shipped to ATS Labs (but has not been used in a previous study).
Date shipped to ATS Labs: _____ Sent via *overnight* delivery? ☐ Yes ☐ No
☒ Will be shipped to ATS Labs.
Date of expected receipt at ATS Labs: Nov 18, 2013
☒ Sender (if other than Sponsor): CDG Environmental

COMPLIANCE

Study to be performed under EPA Good Laboratory Practice regulations (40 CFR Part 160) and in accordance to standard operating procedures.

- ☒ Yes
☐ No (Non-GLP Study)

PROTOCOL MODIFICATIONS

- ☒ Approved without modification
☐ Approved with modification

PROTOCOL ATTACHMENTS

Supplemental Information Form Attached - ☐ Yes ☒ No

APPROVAL SIGNATURES

SPONSOR:

NAME: Dr. Carolina Mateus TITLE: DCS Technical Service
SIGNATURE: Carolina Mateus DATE: Nov. 5, 2013
PHONE: (816) 891 - 6965 FAX: (816) 891 - 6990 EMAIL: carolina.mateus@delaval.com

For confidentiality purposes, study information will be released only to the sponsor/representative signing the protocol (above) unless other individuals are specifically authorized in writing to receive study information.

Other individuals authorized to receive information regarding this study: ☐ See Attached

ATS Labs:

NAME: [Signature]
Study Director
SIGNATURE: [Signature] DATE: 11/22/13
Study Director

Template: 215-1J

-Proprietary Information -

1285 Corporate Center Drive, Suite 110 • Eagan, MN 55121 • 877.287.8378 • 651.379.5510 • Fax: 651.379.5549